occasion to collect and determine plants or to study abnormal plant growths. It is the only reasonably complete publication of the kind in America. There are a total of 1439 species, most of which can very readily be recognized by means of the key, the 250 text illustrations, and the 16 full page plates. The publication is indexed both with reference to the host and the parasite.—Mel. T. Cook.

North American Flora.—The sixth part of volume 22 contains the conclusion of Rosaceae by Rydberg, including genera 54 to 57, much the largest genus being *Rosa*, with 129 species, 23 of which are described as new. The part closes with 26 pages of additions and corrections to the volume.

The first part of volume 32 contains the beginning of Rubiales by Standley, 8 genera of the Rubiaceae being presented. Much the largest genus is *Rondeletia*, with 109 species, 8 of which are described as new. Among the remaining genera 8 new species are described.—J. M. C.

NOTES FOR STUDENTS

Secondary dormancy in seeds.—Kidd and West[3] have continued the study of the controlling action of carbon dioxide on the germination of seeds of *Brassica alba*. In two previous papers by the senior author it has been shown that low concentrations of carbon dioxide inhibit the germination of seeds, and that temperature and oxygen pressure determine the concentration necessary to inhibit germination. In normal oxygen pressure 2–4 per cent carbon dioxide will inhibit germination at 3° C., while at 20° C. it requires 20–25 per cent. At 17° C. it requires 9–12 per cent carbon dioxide to inhibit with 5 per cent oxygen pressure and 20–25 per cent carbon dioxide with 20 per cent oxygen pressure. All seeds studied, except *Brassica alba*, germinate normally as soon as the carbon dioxide is removed, while *B. alba* remains dormant after the carbon dioxide is removed. The authors term this "secondary dormancy," in agreement with the usage of this term by Crocker.

In the production of secondary dormancy the authors note the following general facts: (1) secondary dormancy is not produced if oxygen is absent during the primary period of inhibition or if carbon dioxide has been used in too high concentration; (2) conditions during the primary period of inhibition which prevent subsequent occurrence of dormancy are the ones that exercise injury on the radicle; (3) 100 per cent dormancy is obtained only within narrow limits of carbon dioxide and oxygen pressure. Secondary dormancy is not produced by a change in the permeability of the coats to gases or water, or to an increase in their breaking strength, but by a change in the embryo

[3] Kidd, F., and West, C., The controlling influence of carbon dioxide. The production of secondary dormancy in seeds of *Brassica alba* following treatment with carbon dioxide and the relation of this phenomenon to the question of stimuli in growth phenomena. Ann. Botany **31**:457–487. 1917.

by which it becomes less responsive to germinative conditions. The following conditions caused the secondarily dormant seeds to germinate: removal or partial removal of the testa; redrying of the soaked seeds; short exposures to high or low temperatures; treatment with acids (especially n 0.01 HCl and propionic); treatment with high concentrations of carbon dioxide followed by germination in air. High partial pressures of oxygen had no effect on the germination of secondarily dormant seeds.

The authors give the following interpretation of this work: "It will be seen that the main interest of this communication centers around the causes underlying the initiation of growth rather than in the conditions of dormancy. In considering this question of growth in the case of seeds of *B. alba*, our experiments show clearly that there is no question of limiting factors. We have been able to trace no limiting factor responsible for the non-germination of white mustard seeds showing secondary dormancy. We find ourselves rather in the presence of facts which emphasize a conception of stimulus. It has been seen that widely different treatments, quite unclassifiable in any feature other than that they all result in injury and death, if carried too far, excite germination and growth of white mustard seed. It appears to us probable that some return will have to be made to this conception of stimulus in plant physiology generally, and that in any experimental analysis of the living plant, as a unit and in relation to its life-cycle, the idea of limiting factors, which has so long dominated the minds of plant physiologists, will have to be modified."—WM. CROCKER.

Chondriosomes in plants.—Investigations dealing with chondriosomes have become so numerous that it seems worth while to make a brief summary of the results obtained. As might be expected, a few structures of different nature have been called by the same name; but a host of names have been applied to the same structure, so that we have mitochondria, chondriosomes, chondriomites, chondriokonts, chromidia, sphaeroblasts, histomeres, plasmosomes, cytomicrosomes, etc. The "chondr," meaning a small grain, was chosen because most of the bodies are in the form of small granules; the "mito," meaning thread, is often suggestive, because the granules have a tendency to become arranged in rows. The terms mitochondria and chondriosomes will probably survive, and if a choice should be made between these two, it should be the latter, since it is noncommittal; while the fact that the threadlike arrangement is by no means universal is an objection to the term mitochondria. The name chromidia was applied because the writer believed that the granules were portions of the chromatin extruded from the nucleus. Such granules certainly occur in animals and possibly in plants, but they are not the same structures as the chondriosomes.

A historical résumé of the subject, with a very complete bibliography up to 1914, was compiled by CAVERS,[4] and in an investigation upon the rela-

[4] CAVERS, F., Chondriosomes (mitochondria) and their significance. New Phytol. **31**:170–180. 1914.